of 35%. Repeat coronary angiography before discharge showed a patent LAD coronary artery.

Fitzpatrick *et al* suggest that the improvement in rhythm control and haemodynamic status seen after IABP insertion was due to spontaneous re-opening of the infarct-related vessel. Our observations confirm that patency of the infarct-related vessel may be associated with arrhythmia control. There have been no randomised trials of the value of emergency intervention in such circumstances. Nevertheless, it is clear that restoration of vessel patency by intracoronary thrombolysis, with or without angioplasty, may be a life-saving intervention in acute myocardial infarction complicated by ventricular arrhythmias that remain uncontrolled despite appropriate drug therapy

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Lack of rebound during intermittent transdermal treatment with glyceryl trinitrate in patients with stable angina on background β blocker

SIR,—Holdright *et al* in presenting their evidence of lack of rebound during intermittent transdermal treatment with glyceryl trinitrate in patients with stable angina on background β blocker (*British Heart Journal* 1993;**69**:223-7) unfortunately left out one important limitation of their study. The rebound effect described in previous studies was seen in the exercise test in the morning after the patch had been removed the previous evening,[1] or as an increase in numbers of attacks in the evening after removal of the patch worn during the day.[2] In the daytime, patients generally spend their time upright and walking around, activities resulting in greater sympathetic activation and more hydrostatic pressure in the lower extremities than when the patch is worn at night when patients rest supine most of the time and are subject to low sympathetic activation. Parker *et al* showed that intermittent daytime patch administration of glyceryl trinitrate in young healthy volunteers was associated with increases in plasma catecholamines, plasma renin, and antidiuretic hormone.[3] Such a mechanism may also operate in elderly patients, particularly as increasing age seems to be related to increased sensitivity to glyceryl trinitrate.[4]

Though Holdright *et al's* explanation that background β blocker treatment was responsible for the absence of the rebound effect is quite plausible, it remains unproven until the same type of study has been performed with daytime application of the glyceryl trinitrate patch.

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1 DeMots H, Glasser SP. Intermittent transdermal nitroglycerin therapy in the treatment of chronic stable angina. *J Am Coll Cardiol* 1989;**13**:786–93.
2 Ferratini M, Pirelli S, Merlini P, Silva P, Pollavani G. Intermittent transdermal nitroglycerin monotherapy in stable exercise-induced angina: a comparison with a continuous schedule. *Eur Heart J* 1989;**10**: 998–1002.
3 Parker JD, Farrel B, Fenton T, Conamin MA, Parker JO. Counter-regulatory responses to continuous and intermittent therapy with nitrolycerin. *Circulation* 1991;**84**:2336-45.
4 Cahalan MK, Hashimoto Y, Aizawa K. Verotta D. Ionescu P, Balea M, *et al.* Elderly, conscious patients have an accentuated hypotensive response to nitroglycerin. *Anesthesiology* 1992;77:646-55.

This letter was shown to the authors, who reply as follows:

SIR,—Dr Nyberg raises an interesting point about the mechanism of rebound associated with intermittent nitrate therapy. It is plausible that patch application at night resulted in less neurohumoral activation than would have occurred with daytime therapy. However, as we originally stated,[1] we based the study design on the known circadian pattern of angina in order to maximise the likelihood of detecting rebound after patch removal. Exercise tests were performed in the morning to coincide with the well-recognised morning peak of ischaemia. The benefits of such a schedule have to be weighed against the possibility that nocturnal patch application results in less sympathetic activity than daytime therapy. However, neurohumoral activation is only one mechanism that could be responsible for the rebound phenomenon. Other mechanisms that are independent of the timing of patch application include sulphydryl depletion, desensitisation of soluble guanylate cyclase, and plasma volume shifts related to altered capillary pressure.[2 3]

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1 Holdright DR, Katz RJ, Wright CA, Sparrow JL, Sullivan AK, Cunningham AD, Fox KM. Lack of rebound during intermittent transdermal treatment with glyceryl trinitrate in patients with stable angina on background β blocker. *Br Heart J* 1993;**69**:223-7.
2 Needleman P, Johnson EM Jr. Mechanism of tolerance to organic nitrates. *J Pharmacol Exp Ther* 1987;**184**:7009–15.
3 Abrams J. Clinical aspects of nitrate tolerance. *Eur Heart J* 1991;**12**(Suppl E):42-52.

Is there such a thing as normal sinus rate?

SIR,—Although in his viewpoint Professor Meijler wrestled with the perpetually belaboured concept of "normal", he began: "The currently accepted limits for a normal (sic) sinus rate were set at 60 and 100 beats per minute by Kossmann in 1953".[1] These limits were set long before 1953 in consecutive editions of the New York Heart Association's Nomenclature and Criteria in 1928 for "regular sinus rhythm" and subsequently in the 4th (1943) edition and thereafter for "normal sinus rhythm"[2] at least partly because 60 beats per minute represents exactly five 200 ms boxes on ECG paper and 100 beats per minute represents three 200 ms boxes. Kossmann clearly described these limits as being chosen "for convenience and for uniformity of designation." In any event, in our paper we were not concerned with electrocardiography, but rather with clinical and epidemiological appropriateness.[3]

Professor Meijler referred to Murphy's seven definitions of normal.[4] In a reply to the single letter that was critical of our work, I have already cited Murphy and have emphasised that our proposal of "normal" was as an *operative* definition in Murphy's sense of "acceptable"[5] (not noted by Professor Meijler). My colleagues and I understood that under conditions other than resting daytime ones individuals could indeed have sinus heart rates that are normal though beyond both of the operational (resting) limits that we proposed, as, for example, during sleep or during the range of physical activity. Moreover, if our paper were regarded as a redefinition of sinus tachycardia and bradycardia, the word "normal" could have been omitted from the title with no loss of message.

Professor Meijler challenges our study group (500 patients) as perhaps not being "a sufficiently large and appropriately stratified healthy sample". However, as we reported, our results accord with the results in the 5000 patients reported by the Framingham Heart Study.[3] Moreover, a personal message from Professor Rauttaharju of EPICORE ((Cardiology) Epidemiology Coordinating and Research Centre) (Alberta, Canada) cites comparable results in over 18 000 normal subjects. He has designed an abstract (now accepted) for our joint presentation at a forthcoming scientific meeting.

On the basis of past contributions Professor Meijler's views deserve respectful attention. However, in a survey of 136 distinguished members of the American College of Cardiology (many of them Professor Meijler's peers) over 90% agreed with the operational rate limits of 50 to 90 beats per minute with only two votes for the status quo and with the remainder supporting different variants.[6]

Professor Meijler refers to the increased cardiovascular mortality predicted by increased resting heart rates and asks "How important is the difference in mortality between patients with heart rates of 90 and 100"? The answer awaits an appropriately designed and executed investigation. No formal investigation underlay the traditional 60 to 100 beats per minute range. Why then does Professor Meijler prefer this range to ours, which is based on the results of an appropriately designed study and are consistent with Framingham and EPICORE data? Indeed, so few subjects had rates between 90 and 100 beats per minute that there may, indeed, be a critical difference in that range.

In his last sentence Professor Meijler offers a truism—that is, trivial changes in "normal" boundaries irrespective of statistical significance may not reflect biological significance. Yet, his very first sentence about "accepted limits" tacitly agrees that there can be conventional ("accepted") normal limits. In Professor Meijler's hospital do reports on electrocardiograms (computer generated or other) use "normal sinus rhythm" for regular sinus rhythms between 60 and 100 beats per minute and "sinus tachycardia" and "sinus bradycardia" for faster and slower rates?

Terminology greatly influences thought patterns, because "linguistic usage shapes